

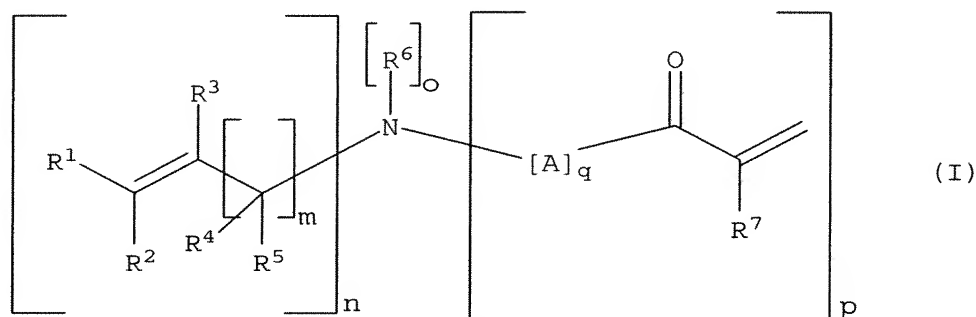
REMARKS

Claims 1-8 and 10-12 are pending in the application. Claims 13-18 have been added to the application by this amendment. Therefore, claims 1-8 and 10-18 are at issue.

Support for new claims 13-18 can be found in the specification for example, at page 15, lines 32 and page 16, lines 25-27. Claim 5 has been amended to correct an obvious typographical error.

The present invention is directed to novel compounds (claims 1-3) useful as internal crosslinkers for swellable hydrogel-forming polymers (claims 5-7 and 13-18). The present invention also is directed to methods of preparing the novel compounds (claim 4), methods of preparing the hydrogel-forming polymers (claims 8, 11, and 12), and a hygiene article containing the crosslinked swellable hydrogel-forming polymers (claim 10).

In particular, the present claims recite (meth)acrylic esters of unsaturated aminoalcohols of general formula (I)



wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , m , n , o , p , q , and A are defined as recited in the claims. These novel compounds are prepared by a transesterification of an aminoalcohol with lower esters of (meth)acrylic acid. In the transesterification, the ester is consumed, and the generated lower alcohol is removed, for example, by distillation.

Important features of the claimed (meth)acrylic esters are that (a) the compound is tertiary amine, (b) the compound contains *two different* ethylenically unsaturated groups, i.e., an allyl group and an acryl group, (c) the compounds contain two or three ethylenically unsaturated groups in total, i.e., o can be zero, and (d) the compound

contains 2 to 100 alkyleneoxy A groups. This combination of features is neither taught nor suggested by the prior art.

Claims 1-8 and 10-12 stand rejected under 35 U.S.C. §103 as being obvious over various patent references. For the reasons set forth below, applicants traverse these rejections.

Prior to addressing the present rejections, the U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness under 35 U.S.C. § 103 is determined by: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level or ordinary skill in art; and, (4) inquiring as to any objective evidence of non-obviousness.

The Patent Office must clearly articulate facts and reasons why the claimed invention "as a whole" would have been obvious to a hypothetical person having ordinary skill in the art at least as of the claimed invention's effective filing date. *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007) (citing with approval *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.")).' see also MPEP §2143 ("The key to supporting any rejection under 35 U.S.C. §103 is the clear articulation of reason(s) why the claimed invention would have been obvious.").

To reach a proper determination under 35 U.S.C. §103(a), the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicants' disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search, and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicants' disclosure is often difficult to avoid due to the very nature of the examination process.

However, *impermissible hindsight must be avoided* and the legal conclusion must be reached on the basis of the *facts* gleaned from the prior art. MPEP §2142.

Furthermore, to establish a *prima facie* case of obviousness, the examiner must satisfy three requirements. First, as the U.S. Supreme Court very recently held in *KSR International Co. v. Teleflex Inc. et al.*, 127 S.Ct. 1727 (2007), "a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. ...it [may] be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was *an apparent reason* to combine the known elements in the fashion claimed by the patent at issue. ...it can be important to *identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements* in the way the claimed new invention does... because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." (emphasis added, *KSR, supra*). Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *Amgen Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Lastly, the prior art references must teach or suggest all the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

As recently articulated by the Court of Appeals for the Federal Circuit in *Ortho-McNeil Pharmaceutical Inc. v. Mylan Laboratories Inc.*, 86 USPQ 2d, 1196, 1201-2 (Fed. Cir. 2008):

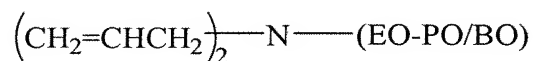
"As this court has explained, however, a flexible TSM test remains the primary guarantee against a non-statutory hindsight analysis such as occurred in this case. *In re Translogic Tech., Inc.* 504 F.3d 1249, 1257 [84 USPQ 2d 1929] (Fed. Cir. 2007) ("[A]s the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention.)."

Claims 1-8 and 10-12 stand rejected under U.S.C. § 103 as being obvious over Anchor et al. U.S. Patent No. 5,478,883 ('883). The basis of the rejection is that the '883

patent discloses a polymerizable surfactant derived from diallylamine, ethylene oxide, and propylene oxide/butylene oxide, which the examiner admits is different in structure from a presently claimed (meth)acrylic ester of an unsaturated aminoalcohol.

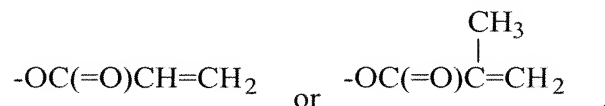
The '883 patent discloses an emulsion polymerization wherein a water-*insoluble* ethylenically unsaturated monomer (column 2, lines 28-31) is copolymerized with a water-soluble polymerizable ethylenically unsaturated surfactant (column 2, lines 34-36). The result of the polymerization are discrete solid polymeric particles suitable for use in coating and/or adhesive applications (column 2, lines 26-28 and 53-56). Such particles are *not* swellable hydrogel-forming polymer particles.

The polymerizable surfactant of the '883 patent is prepared as set forth at column 2, lines 36-45, wherein diallylamine is reacted with (a) ethylene oxide (EO) and (b) propylene oxide and/or butylene oxide (PO/BO). The polymerizable surfactant of the '883 patent therefore has a generalized structure of



This structure differs substantially from a presently claimed (meth)acrylic ester because it *lacks* a (meth)acryl group at the (EO-PO/BO) end of the compound. As a result, the polymerizable surfactant of the '883 patent has only *one* ethylenically unsaturated group and cannot perform as an internal crosslinker for a swellable, hydrogel-forming polymer.

It must be noted that the compounds of the '883 patent terminate with a hydroxyl (-OH) group of the EO, PO, or BO, but the present (meth)acrylic esters terminate with a (meth)acryl group, i.e.,



As demonstrated below, this (meth)acryl group is an essential feature of the claimed (meth)acrylic acid esters because the presence of two ethylenically unsaturated groups are

necessary to perform the internal crosslinking function and the presence of two different *types* of ethylenic unsaturation, i.e., allyl and (meth)acryl, as claimed, provides improvements in internal crosslinking of hydrogel-forming polymers.

As a result of this difference in structure between the ethylenically unsaturated surfactant of the '883 patent and the presently claimed (meth)acrylic esters, the cited reference fails to teach or suggest all of the limitations of the claims. Accordingly, a *prima facie* case of obviousness of claims 1-8 and 10-18 cannot be established.

In addition, a person skilled in the art would have had no incentive or motivation to modify the ethylenically unsaturated surfactant of the '883 patent in a way necessary to arrive at the presently claimed (meth)acrylic esters of aminoalcohols. To arrive at the present compounds, it would have been necessary to react a surfactant of the '883 patent with (meth)acrylic acid, and thereby consume the terminal hydroxyl group of the surfactant. Such a reaction removing the hydroxyl group would result in a strong decrease in surfactant activity because of the loss of the hydroxyl group. The '883 patent requires the presence of an ethylenically unsaturated *surfactant*, and therefore discourages this proposed modification. In fact, such a modification would destroy the teaching of the '883 patent, which requires the presence of an ethylenically unsaturated *surfactant*.

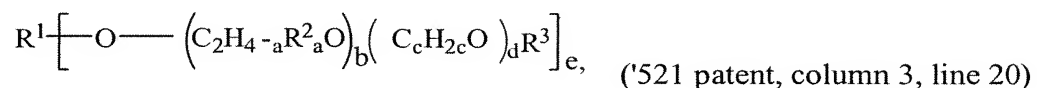
Further, the '883 patent is directed to polymeric particles useful for coatings and adhesives, not to compounds useful as internal crosslinkers for swellable hydrogel-forming polymers. The '883 patent is totally silent with respect to the swellable, hydrogel forming polymer recited in the claims. Persons skilled also in the art also could not have predicted the improved crosslinking capabilities provided by the presently claimed (meth)acrylic esters, as discussed below.

It is therefore submitted that the present claims would not have been obvious under 35 U.S.C. § 103 over the '883 patent for the reasons set forth above, and that the rejection of claims 1-8 and 10-12 should be withdrawn. It is further submitted that new claims 13-18 would not have been obvious over the '883 patent.

Claims 1-8 and 10-12 also stand rejected under 35 U.S.C. § 103 as being obvious over Gruning et al. U.S. Patent No. 6,268,521 ('521) in view of Witteler et al. U.S.

Patent Application Publication No. 2003/0091602 ('602 publication). The rejection is based upon a contention that because the '521 patent teaches (meth)acrylic esters of polyoxyethylenes and the '602 publication teaches nitrogen-containing compounds reacted with an alkylene oxide, it would have been obvious to commingle the various functional groups of these two very different structures and thereby arrive at the present claimed (meth)acrylic esters of unsaturated aminoalcohols, and to use them as internal crosslinkers for a hydrogel-forming polymer. Applicants traverse this rejection.

The '521 patent discloses the enzymatic preparation of (meth)acrylic esters of polyoxyalkylenes by esterifying a polyoxyalkylene having a structure below with (meth)acrylic acid:



wherein R^1 is hydrogen, a hydrocarbon radical, or a carbohydrate. ('521 patent, column 3, lines 13-41). Various polyoxyalkylenes are illustrated at column 4, lines 1-36 of the '521 patent. *No* polyoxyalkylene of the '521 patent contains a nitrogen atom or an amino group, and the definition of the polyoxyalkylene in the '521 patent *does not permit* the presence of a nitrogen atom or amino group. The most shown by the '521 patent is a polyoxyalkylene containing a vinyl group, which provides a (meth)acrylic ester containing a vinyl group ($\text{CH}_2=\text{CH}$) and a (meth)acryl group. Vinyl groups differ from allyl groups, and the compounds of the '521 patent lack a nitrogen atom, i.e., are not amines.

The '521 patent is limited to the above teaching, with no suggestion that the structure of the polyoxyalkylene can be modified or expanded. The '602 patent publication does not overcome the deficiencies of the '521 patent.

The '602 publication is directed to a method of treating a cosmetic composition with radiation before, during, or after application. It is obvious that the field of endeavor in the '602 publication is vastly different from internally crosslinked hydrogel-forming polymers.

The '602 publication teaches the polymerization of a monomer on skin, hair, or nails to form a film. The monomer is crosslinked with a crosslinker disclosed at paragraphs [0081] and [0082] of the '602 publication. Included in the disclosed list of crosslinkers are triallylamine and triallylamine salts. (Meth)acrylic esters of polyoxyalkylene, such as disclosed in the '521 patent, also are disclosed. These all are standard, well known crosslinkers for ethylenically unsaturated monomers.

The '602 publication fails to teach or suggest reacting triallylamine or a salt thereof with an alkylene oxide, as required by the present claims, and the '521 patent fails to provide any suggestion or incentive to do so. The '602 publication merely teaches a reaction between an alkylene oxide and a polyhydric alcohol. Furthermore, if a person skilled in the art should react *triallylamine* with ethylene oxide, the resulting product would result in a quaternary amine salt having *three* allyl groups. In this structure, the "n" variable in the present general formula (I) would be 3. However, the present *claims* limit "n" to 1 or 2. In addition, the presently claimed (meth)acrylic ester is *not* a quaternary ammonium compared, as shown in structure formula (I).

Accordingly, the '602 publication fails to teach or suggest a precursor compound that can be subjected to the reaction of the '521 patent. Using the modified structure of the '602 publication in the process of the '521 patent does *not* yield a presently claimed compound. In addition, the references fail to lead a person skilled in the art to make the modifications and jumps in reasoning proposed by the examiner, and the examiner has articulated *no* facts as to why the invention as a whole would have been obvious.

In contrast, it appears that the examiner has used hindsight reasoning to cobble together functional groups from vastly different compounds in the two references, and concluded that it would have been obvious to a person skilled in the art to rearrange functional groups and compound structures to arrive at the presently claimed compounds. However, this hindsight reasoning fails because even cobbling together the functional groups from the different compounds of the cited references does *not* provide the presently claimed compounds.

In summary, it is submitted that the references, in combination, fail to teach or suggest *all* of the limitations of the claims, i.e., a compound having allyl and (meth)acryl

groups, wherein n is 1 or 2. The arguable combination of references teaches no more than (a) n=3 and (b) all these groups are allyl groups (neither (a) nor (b) is encompassed by the present claims). Therefore, because the combination of references fails to teach or suggest all the limitations of the claims, a *prima facie* case of obviousness over this combination of references cannot be sustained.

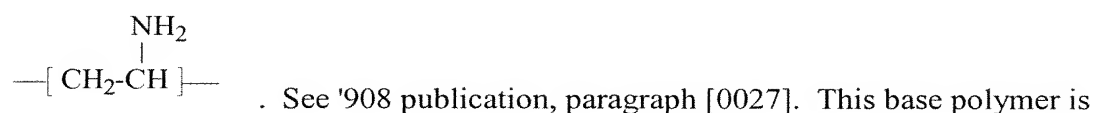
In addition, the examiner has articulated *no* facts or reasons that would have prompted a person skilled in the art in the relevant field to combine the elements in the way the claimed invention does. The references disclose various internal crosslinkers having different structures from the claimed compounds, but do not contain any teachings or suggestions that would lead a person skilled in the art to a hydrogel-forming polymer internally crosslinked with a compound recited in claims 1, 2, or 3.

It is therefore submitted that the present claims would not have been obvious over the '521 patent in view of the '602 publication for the reasons set forth above, and that the rejection of claims 1-8 and 10-12 should be withdrawn. It is further submitted that new claims 13-18 would not have been obvious over a combination of the '521 patent and '602 publication.

Claims 1-8 and 10-12 stand rejected over 35 U.S.C. § 103 as being obvious over Andre et al. U.S. Patent Publication No. 2003/0143908 ('908 publication). Applicants traverse this rejection.

The '908 publication discloses the use of alkoxylated polyvinylamines in the modification of surfaces. The disclosed compounds are *substantially* different from the claimed compounds, such that *no* modification could lead to the presently claimed compounds.

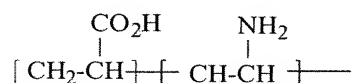
First, the compounds of the '908 patent contain *no* ethylenic unsaturation. The base polymer is a polyvinylamine having a structure of repeating units of



alkoxylated on the amine (-NH₂) moiety with a polyoxyalkylene, as set forth in the '908 patent at paragraph [0010], formula (I).

The compounds of the '908 publication clearly contain no ethylenically unsaturated groups, let alone *both* an allyl group and a (meth)acryl group as required by the present claims. The '908 publication contains *no* hint or suggestion that the disclosed compounds should be modified in any way, and it is submitted that modification would be detrimental to the surface modification properties of the disclosed polyalkoxylated polyvinylamine, as required by the '908 publication.

In addition, the examiner's reliance on comonomer B to support the rejection is misplaced. The comonomers B are present in the polymerization of N-vinylformamide, and the vinyl group of comonomer B is consumed. In the preparation of polyvinylamine, N-vinylformamide is polymerized, optionally in the presence of comonomer B (e.g., acrylic acid), then the poly-N-vinyl formamide is hydrolyzed to form polyvinylamine. When acrylic acid is comonomer B, the resulting polymer contains units of *polymerized* acrylic acid and vinylamine, i.e., a structure, for example:



This copolymer then is alkyoxlated in accordance with the '908 publication disclosure. It is evident that even if a comonomer B is present, the compound is totally *devoid* of ethylenically unsaturated groups.

In summary, it is submitted that the '908 publication fails to teach or suggest all of the limitations of the claims, i.e., a compound containing both an allyl and a (meth)acryl group. In contrast, the compounds of the '908 patent publication contain *no* ethylenically unsaturated groups.

In addition, the '908 publication provides no suggestion or incentive to modify the reference in a manner that leads to the present claims. The compounds of the '908 publication are utilized for their surface modification properties. By modifying the compounds by adding any ethylenically unsaturated group, the hydroxyl terminal group of

the oxyalkylene claim is consumed, and surfactant properties are lost. Further, there is absolutely *no* suggestion to modify the compounds to containing both an allyl and a (meth)acryl group.

Finally, the present claims recited a compound containing a *single* nitrogen atom, as opposed to the plurality of nitrogen atoms present in a polyvinylamine. In summary, the compounds of the '908 publication are *so different* from the presently claimed compounds, that *no* modification of the '908 compounds could lead to the presently claimed compounds.

It is therefore submitted that the present claims would not have been obvious of the '908 publication for the reasons set forth above, and that the rejection of claims 1-8 and 10-12 over the '908 publication should be withdrawn. It is further submitted that new claims 13-18 also would not have been obvious over the '908 publication under 35 U.S.C. § 103.

In addition, with respect to each of the above rejections, *no* cited reference teaches or suggests a swellable, hydrogel-forming polymer internally crosslinked with a (meth)acrylic ester of claims 1, 2, or 3.

The examiner has identified *no* reason that would have prompted a person skilled in the art *in the relevant field* to combine the elements in the way the claimed invention does. First, some of the references are *not* in the relevant field, i.e., hydrogel-forming polymers. Second, the references disclose various internal crosslinkers, but do not contain any teachings or suggestions that would lead a person skilled in the art to a hydrogel-forming polymer internally crosslinked with a compound recited in claims 1, 2, or 3.

In addition, even if a *prima facie* case of obviousness should be established in any of the three above-discussed rejections, the presently claimed hydrogel-forming polymers, that are internally crosslinked by a compound of claims 1, 2, or 3, exhibit unexpected results. In particular, hydrogel-forming polymers of the present invention have a balanced profile with respect to absorption capacity, gel strength, take up rate, and extractables (specification, page 2, lines 32-35). This balanced profile is related to the internal crosslinker, i.e., the compounds of claims 1, 2, or 3, used to prepare the polymer.

The specification at pages 29-31 includes Comparative Examples and Examples 11-15. The Comparative Examples utilize trimethylolpropane-15 EO triacrylate and tripropylene glycol diacrylate as internal crosslinkers. These crosslinkers each contain three acryl functionalities. However, these crosslinkers do *not* contain an allyl group.

Examples 11-15 are internally crosslinked with a crosslinker of the present invention, i.e., an acryl group and an allyl group. The table at page 31 of the specification shows that Examples 11-15 retained absorbency compared to the Comparative Examples *and* had a reduced amount of extractables. The reduced amount of extractables shows that a crosslinker recited in the present claims polymerizes the monomers comprising the hydrogel-forming polymer more efficiently, such that the amounts of low molecular weight oligomers and monomers (i.e., extractables) are reduced (specification, page 31, lines 16-20).

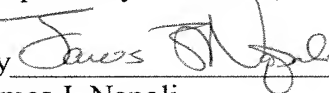
Accordingly, applicants demonstrate an unexpected and unpredictable result compared to the closest prior art, i.e., a crosslinker containing three acryl groups (comparative) vs. a crosslinker containing an acryl group and two allyl groups.

It is submitted that the application is in a scope and form for allowance. An early and favorable action on the merits is respectfully requested.

Should the examiner wish to discuss the foregoing, or any matter of form in an effort to advance this application toward allowance, the examiner is urged to telephone the undersigned at the indicated number.

Dated: August 3, 2009

Respectfully submitted,

By 

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